

TABLE II.—*Cycle of Rainfall and Sun-spots shown in the Minimum, Intermediate, and Maximum Groups.*

	Average of rain-fall in inches, registered at Madras.	Average of rain-fall in inches, registered at Bombay.	Average of rain-fall in inches, registered at Cape of Good Hope.	Average relative number of sun-spots (old list).
Minimum group: eleventh, first, and second years...	40°39	68°78	21°05	10°32
Intermediate group: third and fourth, with tenth and ninth years	49°07	71°89	23°59	36°71
Maximum group: fifth, sixth, seventh, and eighth years	53°50	75°23	27°95	63°61

I regret that I have not the materials for showing the rainfall for Bombay and the Cape during the whole sixty-four years for which the returns exist for Madras.

The other point on which I venture to trouble you at present has reference to a different class of atmospheric phenomena. I think that it may now be affirmed that a cycle of wind-disturbances exists and is coincident with, although slightly lagging behind, the cycle of sun-spots. M. Poëy called the attention of the French Académie des Sciences to this subject five years ago, and published, as far back as 1873, a list of hurricanes in the West Indies from 1750 to 1873 in support of his views. Dr. Meldrum has worked out the same question, as regards the [East] Indian Ocean, with admirable patience and success. On the publication of my cycle of Madras rainfall it struck Mr. Henry Jeula, Honorary Secretary to the late Statistical Committee at Lloyd's, that the subject might have a practical bearing upon under-writing and marine risks. He collected from Lloyd's Loss Book the statistics for the two last eleven-year cycles (1876-66, and 1865-55), the only ones for which materials were available; and conjointly, we have tabulated the results. We found that the percentage of losses on registered vessels of the United Kingdom was 17½ per cent. greater during the two years of maximum sun-spots (the eleventh and first of the cycles) than during the two years of minimum sun-spots (the fifth and sixth of the cycles). In the same way we found that the percentage of the total losses (calculated on the eleven years) posted on Lloyd's Loss Book was 15 per cent. greater during the two years of maximum than during the two years of minimum sun-spots. We further found that the increase and decrease of losses follows a cycle, closely following (although for sufficient reasons somewhat lagging behind) the cycle of sun-spots. These results can be tested from the succeeding tables.

TABLE III.—*Percentage of Losses posted on Lloyd's Loss-Book, compared with the Eleven-Year Cycles of Sun-spots and of the Rainfall at Madras.*

	On registered vessels of the United Kingdom.	On total losses posted in eleven years.	Average of rain-fall at Madras. Inches.	Average relative number of sun-spots (Wolf's lists).
Minimum group: Eleventh series of years of the cycles ...	9°93	7°64	37°03	10°9
Average of first and second years of the cycles ...	11°91	9°33	42°07	10°0
Average of third and fourth years of the cycles ...	11°05	8°64	49°12	39°8
Average of fifth and sixth years of the cycles ...	12°21	9°31	54°64	73°4
Average of seventh and eighth years of the cycles ...	12°82	9°81	52°36	51°7
Average of ninth and tenth years of the cycles ...	11°84	9°09	49°02	33°5
Average of eleventh years of the cycles ...	9°93	7°64	37°03	10°9

Dividing the eleven years as nearly as the number admits by three, into a minimum, an intermediate, and a maximum group, we get the following results:—

TABLE IV.—*Percentage of Losses posted on Lloyd's Loss-Book, compared with the Eleven-Year Cycles of Sun-spots and of the Rainfall at Madras.*

	On registered vessels of the United Kingdom (1855-1876.)	On total losses posted in each eleven years (1855-1876.)	Average of rain-fall at Madras. Inches (1873-1876.)	Average relative number of sun-spots (Wolf's lists) (1810-1860.)
Minimum Group. Average of first, second, eleventh, and tenth years of the cycles	11°13	8°64	41°58	14°26
Intermediate Group. Average of third, fourth, ninth, and eighth years of the cycles	11°90	9°21	51°37	42°46
Maximum Group. Average of fifth, sixth, and seventh years of the cycles...	12°49	9°53	53°22	64°10

Again, testing the cyclic coincidence, by taking the first four years, the middle or maximum four years, and the remaining three years at the end, a similar result is obtained.

TABLE V.—*Percentage of Losses posted on Lloyd's Loss Book, compared with the Eleven-Year Cycles of Sun-spots and of the Rainfall at Madras.*

	On registered vessels of the United Kingdom.	On total losses posted in eleven years.	Average of rain-fall at Madras. Inches.	Average relative number of sun-spots (Wolf's lists).
Average of first, second, third, and fourth years of the cycles	11°49	8°93	45°00	24°90
Maximum Group. Average of fifth, sixth, seventh, and eighth years of the cycles	10°52	9°56	53°53	63°55
Average of the ninth, tenth, and eleventh years of the cycles	11°20	8°61	45°02	25°99

I think, therefore, that we are justified in concluding that the periodicity observed by M. Poëy in the hurricanes of the Antilles, and by Dr. Meldrum in the cyclones of the Bay of Bengal is of such a character as to exercise a widespread effect upon the commerce of the world. How far these wind-disturbances may be eventually proved to be general throughout the earth's atmosphere, or throughout any given belt of it, I am not yet prepared to offer an opinion. But that the practical results of such wind-disturbances on maritime commerce are of a general character the foregoing tables now place beyond dispute.

In conclusion, I beg to caution fellow-workers that no really trustworthy results are to be obtained from the old plan of jumbling together a number of unhomogeneous stations in a bag and shaking out averages. The true method is to take certain recognised factors in the rainfall, such as the monsoons, and to examine whether any common periodicity exists between the operation of these factors and the sunspots. This is what I have attempted to do for various points around the great basin which stretches southwards from the Bay of Bengal, and what Mr. Archibald has so carefully done in NATURE for Northern India. I am now conducting a similar inquiry into the American and Australian rainfall, but, as already stated, some time must elapse before the results can be presented.

W. W. HUNTER

Allanton House, Lanarkshire, September 20

The Discovery of the Satellites of Mars

As some of the earlier newspaper accounts of Prof. Hall's discovery of satellites of Mars are said to have produced, in some

quarters, an impression not fair to him, and as the same accounts may produce the same impression abroad, it seems proper to make the following statement:—

When on the morning of August 17 Prof. Hall showed me his observations, the communication was purely confidential and friendly, and was not made either in the line of duty or because he failed to recognise the significance of his observations, or because any special skill he did not possess would aid in interpreting them. I suggested that, from the few measures he had made, it was possible to estimate the time of revolution of the satellite, if the object really were one; and thus ventured the prediction that it would be hidden during most of the following night, but would reappear toward morning near the position in which it was seen the night before. The fulfilment of this prediction facilitated the establishment of the true character of the object, but, without it, an equally certain hold on the satellite would very soon have been obtained by Prof. Hall alone. The credit of sole discoverer is therefore due to him.

SIMON NEWCOMB

The Satellites of Mars

It may interest some of the readers of NATURE to know that one of the recently-discovered satellites of Mars appears to have been certainly seen with the six-foot reflector at Parsonstown. My assistant writes me on the 17th instant:—

“On the 8th instant (before receiving the Washington circular) I suspected very strongly at 11:45 P.M., while using the six-foot, that a satellite was visible, following the disc, about 1½ diameters. It appears now from the elements that it must have been the outer one. On the 15th instant, at 11:30 P.M., I saw it quite distinctly preceding the planet, however not well enough to measure it, as I lost it again after a couple of minutes, owing to the strong glare of Mars. Last night I saw it again, but only by glimpses, twice or three times.”

The unfavourable weather prevented the satellites from being looked for between the 8th and 15th instant.

I may add that it seems probable that the satellites might have been measurable on the 15th instant with the bright line micrometer had it not been in the maker's hands. The low meridian altitude of the planet (25° at Parsonstown as compared with 40° at Washington) is of course a serious drawback to observations at the former place.

ROSSE

Yorkshire, September 20

THE weather in this neighbourhood has been very unfavourable for observation ever since the announcement of the discovery of two satellites of Mars. Last night, however (about 9.30), during little more than half-an-hour's interval of clear sky, the air being extremely steady, and the planet beautifully defined, I succeeded in seeing the outer satellite of the two. With the full aperture of my 18-inch silvered-glass equatorial reflector, and an ordinary achromatic eye-piece with a bar across the field hiding the planet, the satellite was but glimpsed occasionally; with a single double-concave lens (power about 180) it was visible, in spite of the brilliant light of the planet. Had I not known its exact position, however, I question whether I should have seen it at all. It is a most difficult object.

HENRY COOPER KEY

Stretton Rectory, Hereford, September 19

A Good Suggestion

THE approaching meeting in London of librarians representing the most important English, and, I believe, foreign, collections of books, makes the present a suitable time to offer suggestions as to the management of such collections.

It has long seemed to me that an improvement might be made of a very simple nature, but capable of greatly increasing the working value of reference libraries, especially those of the first rank; namely, to provide, somewhat as follows, for their being consulted by those who cannot personally visit them.

Suppose that the authorities of such an institution as the British Museum or the Bodleian designate certain persons, not paid officers of the library, but known to its directors as well-educated, trustworthy, and acquainted with the resources of the particular library; publishing the names and addresses of these gentlemen as willing, and believed to be competent, to undertake researches amongst the books for those who may write to them from a distance; the official authorities assuming no actual

responsibility for the work so done, but merely recommending the persons to do it; publishing at the same time a definite statement of the payment expected per day or hour by these persons.

Often when one would desire to consult a great public library in a foreign land, or in a distant part of one's own country, nothing short of a personal visit would be of use, but in very many cases it would be quite possible to obtain all that one desired by a simple business-like correspondence with a proper agent. Sometimes the question is merely whether such or such a book exists in the library, with perhaps an accurate copy of its title; sometimes a special reference to a single page in an old and scarce scientific journal or set of transactions is to be verified; sometimes a few paragraphs are to be copied in the exact words of the author; sometimes a name, date, or number is to be sought out; sometimes a larger amount of work would be needed, but so definitely shaped out that instructions in writing could easily be given for it to an intelligent person on the spot. As it is, the consulting of such a distant library in person is often simply impossible, and even when possible, often involves such expense and delay as to make themselves seriously felt; whereas by the plan proposed, the object in view might often be attained at a cost of time and money altogether trifling. In my own very small experience I once found it necessary to travel some 700 miles, losing three days, and spending about 7½, in order to refer to a book for about ten minutes, while directions for making the same search could have easily been put upon half a sheet of note-paper, and carrying them out would have occupied a person living in the city in which the library was situated altogether not more than an hour or an hour and-a-half.

In the neighbourhood of almost every large library competent men might readily be found to undertake such work as is suggested, and to whom the opportunity of increasing their income, or probably in time earning from this source alone a satisfactory income, would be welcome. The plan would admit of being carried out upon a small or an extended scale; a library of the third or fourth class might afford a field for a single man only, while one of the first class would be likely gradually to enlist the services of a number; if this were so sub-division of labour would be desirable, one person undertaking researches in natural history, another in mathematics, physics, or chemistry, another in classical learning, &c.

While such work could not properly be done by the regular officers of a public library, it would be important that the private individuals who were to enter upon it should have the approval of, and should be recommended by, the library authorities, who might also very properly fix the rate of payment, recommending only those who were willing to accept the rules laid down.

This plan has at least the merit that it might be tested with very little trouble, risk, or disturbance of existing arrangements. I believe that even in England with great libraries situated at comparatively moderate distances from almost every one in the kingdom, it would prove a great convenience; to persons placed as are those who live here in America, with no library of the first rank on this side of the ocean, and with hundreds of miles often separating one from the larger of even those libraries which do here exist, the boon of access by letter to the greatest collections of the world would be inestimable. It would be in a new direction, and a noble one, carrying out the tendency of the most modern civilisation which looks to placing, as far as possible, the resources of the whole earth within the reach of him who lives at any one spot upon its surface.

J. W. MALLETT

University of Virginia, September 5

Some of the Troubles of John O'Toole respecting Potential Energy¹

II.

B.—Potential E., as meaning “energy related to Potential Functions.”

WE now pass to the second meaning of “potential E.” It happens, by a most singular and unfortunate coincidence, that this class of E. can very well be called by that title for a reason quite distinct from that which we have been deprecating. The idea of the potential function, or briefly, potential, was first formed and thus named by Green. It has no reference whatever to existing in possibility; it is concerned with present potency or power; and it happens that potential E. of unit of mass may

¹ Continued from p. 447.